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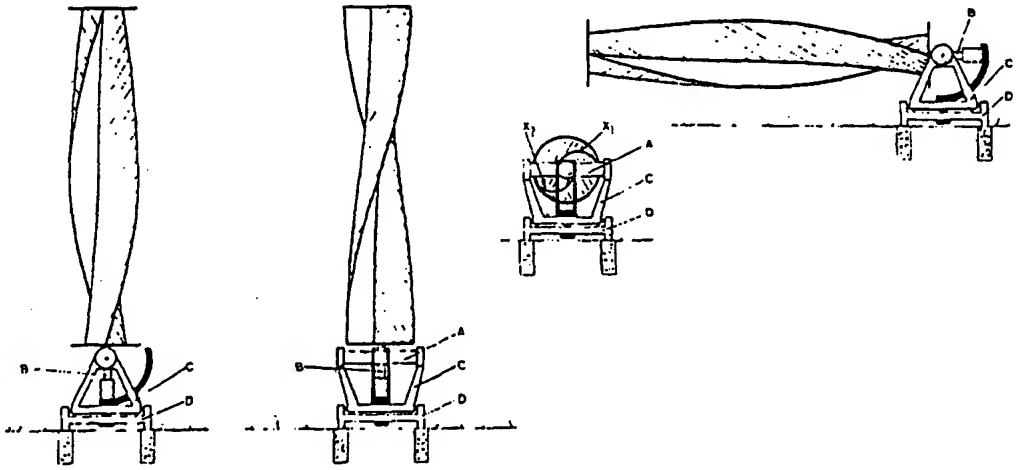

(57) Abstract

A windscrew is a wind rotor characterised in that it rotates when the axis of the rotor is at right angles (fig. 1 and 2) to the wind and when it is located in the direction of the wind (fig. 3 and 4). It operates with unmodified efficiency also in all positions between the vertical (fig. 1 and 2) and the horizontal position (fig. 3 and 4) and always turns the same surfaces towards the wind irrespective of the position of the rotor shaft (B). The rotor wings have a somewhat cambered surface (fig. 1 and 3). The said factors have enable solution of the difficulties inherent in designing a rotor for use at low wind velocities (fig. 1 and 2) and in storms (fig. 3 and 4). The rotor consists of two wings helically twisted about their axis of rotation (fig. 2) by 180 degrees and with a cross-section consisting of two semi-circles (fig. 4x1 and 4x2). The rotor does not comprise end plates and it is possible therefore for the air flow to pass through it from its end (fig. 4) for when the rotor is in the horizontal position it opposes the wind with only one cirular surface (fig. 4). The rotor also includes a foundation (C.D.) enabling it to rotate vertically (fig. 1 and 2), horizontally (fig. 3 and 4) and in all intermediate positions while at the same time following the direction of the wind.

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WINDSCREW

The present design constitutes a wind rotor for producing energy under particularly demanding conditions, where the wind velocity may vary considerably, for instance in Greeland and in the Sahara, areas in which wind rotors have proved to be impracticable. By reinforcing such wind rotors they are made excessively heavy. The windscrew rotor operates at wind velocities from 3 m/s upward (fig. 1 and 2) but it also withstands wind velocities as high as 180 m/s (fig. 3 and 4). It is so designed as to operate also in sandstorms such as occur daily in the Sahara and where the wind velocities may reach 85 m/s. Owing to its simple design the windscrew rotor can also be used at very low temperatures, where it is, for instance, impossible to make use of hydraulic power transmission. Nor do elevated temperatures impede the operation of this design.

The design is principally intended for generating relatively small amounts of electrical energy under difficult conditions, where the use of large, energy-consuming plant is uneconomical. In view of its design the windscrew rotor rotates under all conditions thus continuously meeting its task of producing energy, owing to the fact that it rotates also during displacement between the vertical (fig. 1 and 2) and horizontal (fig. 3 and 4) positions.

The following patents relate to the design and are associated with it:

U.S. patent 4,112,311
Swedish patent 65940
German patent 2540757.

The design of the windscrew rotor is closest to that described in Swedish patent 65940 but with the decisive difference that the present wind rotor rotates also if the axis of rotation is located in the direction of the wind (fig. 3 and 4). It is an improvement and further development of rotors based on the same wing idea. This rotor is made without end plates.

The wings of the rotor may be assumed to be generated by twisting a tube of rigid material 180 degrees about an axis so as to produce a helical shape (fig. 2). Then the tube is halved lengthwise and at

right angles in respect of the axis about which it is twisted. Following separation in two halves every cross-section of the tube exhibits two semi-circles of identical size (fig. 4 - x1,x2).

The windscrew rotor rotates in the vertical position (fig. 1 and 2) and moves steplessly into the horizontal position (fig. 3 and 4), in the direction of the wind and subject to continuous rotation.

In the horizontal position the side facing the wind constitutes a circular surface (fig. 4) which responds to the force of the wind over virtually its entire area. In the vertical position (fig. 1 and 2) the rotor always comprises a relatively large (fig. 1) or two relatively small (fig. 2) concave surfaces alternately turned into the wind so that the concave surface facing the wind is roughly uniform at all times. Also the convex surface facing the wind operates owing to an opening at the centre of the rotor. For the cross-section of the rotor shows that the two semi-circular parts are displaced in relation to one another (fig. 4 x 1 and 4 x2) so that an opening is formed through which air can pass. The two wings of the rotor are turned 180 degrees in relation to one another, from below upward and in the direction of rotation (fig. 2). As a result a greater part of the wind force is concentrated on the lower part of the rotor than on its upper part, which contributes to the strength of the design, and even in the loaded state the speed of the rotor corresponds to about 1.2 times the velocity of the wind.

The windscrew rotor is maintained in its vertical position by a spring installed in the transverse shaft (A) of the foundation. As the force of the wind increases to values entailing dangerous loading of the wings and the rotor shaft (B) the rotor turns stoplessly to the horizontal position in the direction of the wind (fig. 3 and 4).

Since it rotates also in this position it can take advantage of even very large wind forces.

The design offers the advantage of low production costs considering its efficiency under the conditions for which it is intended.

PATENT CLAIMS

1. A wind rotor, c h a r a c t e r i s e d in that it consists of two screw-shaped wings the cross-section of which is semi-circular (fig. 4 - x1 and x2) and in that there is an opening between them where the wind passes from the concave to the convex surface. The wings are mounted without end plates. The height of the rotor is at least four times the diameter.

2. A wind rotor according to claim 1, c h a r a c t e r i s e d in that it rotates in all positions from the vertical (fig. 1 and 2) to the horizontal position (fig. 3 and 4) since the screw-shaped wings are twisted 180 degrees about the axis of the rotor (fig. 2).

3. A wind rotor in accordance with claims 1 and 2, c h a r a c t e r i s e d in that, calculated from the base and in the direction of rotation of the rotor, the wings are twisted in relation to one another by 180 degrees (fig. 1, 2 and 3).

4. A wind rotor in accordance with claims 1, 2 and 3, c h a r a c t e r i s e d in that it is provided with an arrangement (A.C.D.) enabling it to move steplessly from the vertical position to the horizontal position and vice versa in the direction of the wind.

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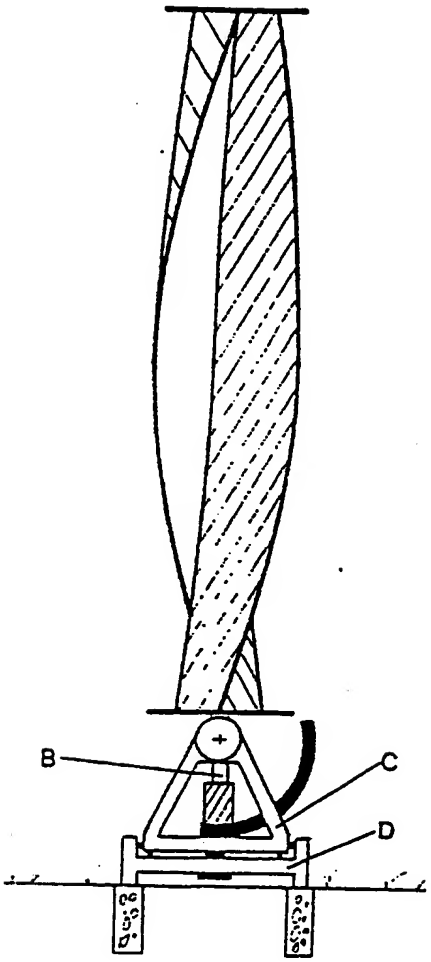

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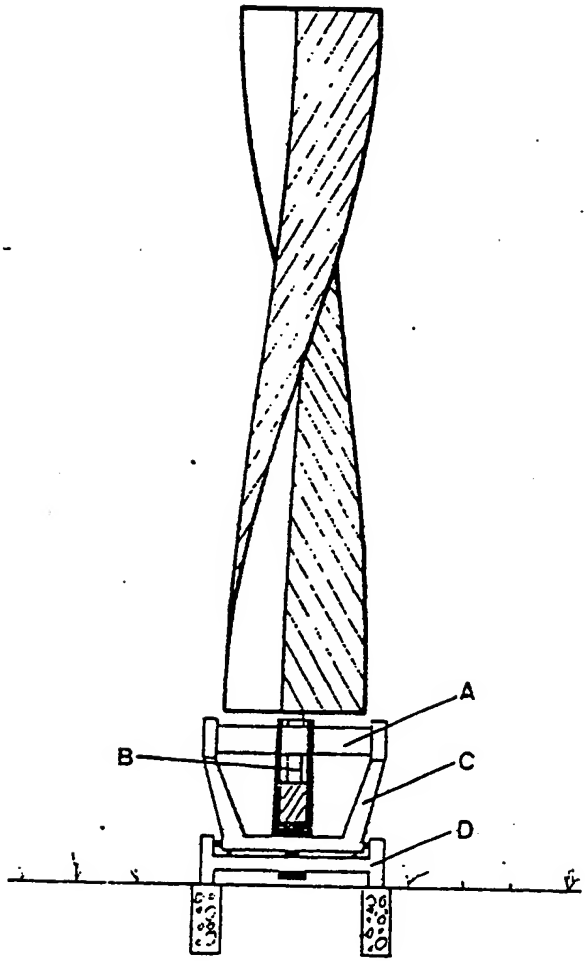

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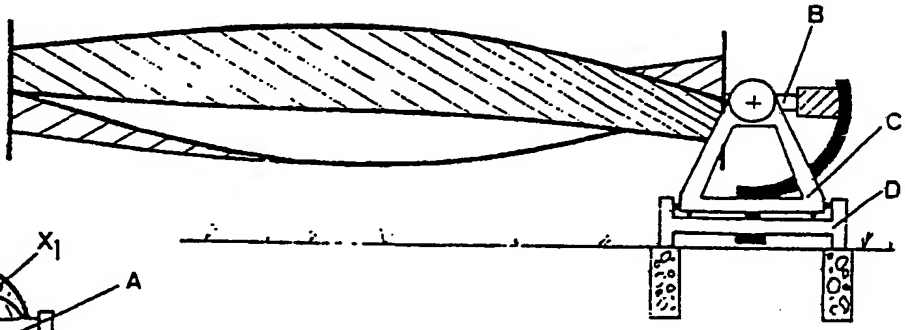

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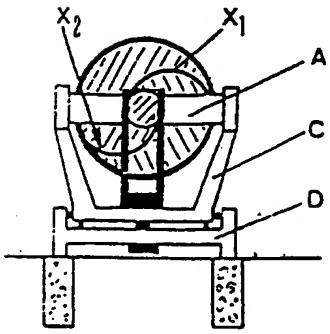

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE80/00063

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC 3

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II. FIELDS SEARCHED

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Classification System	Classification Symbols
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National Cl	88c
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Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [5]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
X	DE, C, 187 865 published 1906, June 28, Theofil Depta	1
X	FR, A, 2 295 259 published 1976, July 16, Simion Jean Alfred Joseph	2-4
A	US, A, 953 891 published 1910, April 5, John H Atkins	
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IV. CERTIFICATION

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1980-07-15	1980-07-21

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WINDSCREW

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Abstract

A windscrew is a wind rotor characterised in that it rotates when the axis of the rotor is at right angles (fig. 1 and 2) to the wind and when it is located in the direction of the wind (fig. 3 and 4). It operates with unmodified efficiency also in all positions between the vertical (fig. 1 and 2) and the horizontal position (fig. 3 and 4) and always turns the same surfaces towards the wind irrespective of the position of the rotor shaft (B). The rotor wings have a somewhat cambered surface (fig. 1 and 3). The said factors have enable solution of the difficulties inherent in designing a rotor for use at low wind velocities (fig. 1 and 2) and in storms (fig. 3 and 4). The rotor consists of two wings helically twisted about their axis of rotation (fig. 2) by 180 degrees and with a cross-section consisting of two semi-circles (fig. 4x1 and 4x2). The rotor does not comprise end plates and it is possible therefore for the air flow to pass through it from its end (fig. 4) for when the rotor is in the horizontal position it opposes the wind with only one circular surface (fig. 4). The rotor also includes a foundation (C.D.) enabling it to rotate vertically (fig. 1 and 2), horizontally (fig. 3 and 4) and in all intermediate positions while at the same time following the direction of the wind.

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(54) **WIND ROTOR DEVICE.**

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DE - C - 187 865
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D scription

The pr sent invention concerns a wind rotor device for producing energy under particularly demanding conditions, where th wind velocity may vary considerably, for instance in Greenland and in the Sahara, areas in which conventional wind rotors have proved impracticable. By reinforcing such wind rotors they are made excessively heavy. The wind rotor device of the present invention is intended to operate at wind velocities from 3 m/s upward (Figs. 1 and 2), and it is also arranged to withstand wind velocities as high as 180 m/s (Figs. 3 and 4). It is so designed as to operate also in sandstorms such as occur daily in the Sahara and where the wind velocities may reach about 85 m/s. Owing to its simple design the wind rotor device is accordance with the present invention can also be used at very low temperatures, where it is, for instance, impossible to make use of hydraulic power transmission. Nor do high temperatures impede the operation of the design.

The device is principally intended for generating relatively small amounts of electrical energy under difficult conditions, where the use of large, energy-consuming plants is uneconomical. In view of its design, the wind rotor device rotates under all conditions, thus continuously meeting its task of producing energy, owing to the fact that it also rotates during displacement between the vertical (Figs. 1 and 2) and horizontal (Figs. 3 and 4) positions.

The following patents relate to the design and are associated with it:

U.S. Patent 4,112,311
Swedish Patent 65,940
German Patent 2,540,757.

The design of the present wind rotor device is closest to that described in Swedish patent 65,940 but with the decisive difference that the present wind rotor rotates also if the axis of rotation is located in the direction of the wind (Figs. 3 and 4). It is an improvement and further development of rotors based on the same wing idea.

The wings of the rotor may be assumed to be generated by halving a tube lengthwise i.e. about an axial plane, maintaining the halves together while twisting the ends of the tube relative to one another about the axis, and then displacing the halves such that their concave portions overlap. Every cross-section of the tube then exhibits two semi-circles X1, X2 of identical size.

The windscrew rotor rotates in the vertical position (Fig. 1 and 2) and moves steplessly into the horizontal position (Fig. 3) in the direction of the wind and subject to continuous rotation.

In the horizontal position the side facing the wind constitutes a circular surface (Fig. 4) which responds to the force of th wind over virtually its entire area.

In the vertical position (Fig. 1 and 2) th r tor always comprises a relativ ly large (Fig. 1) or two relatively small (Fig. 2) concave surface alt rnately turned into the wind s that the concave surface facing the wind is roughly uniform at all times. Also the convex surface facing the wind operates owing to an opening at the centre of the rotor. For the cross-section of the rotor shows that the two semi-circular parts X1 and X2 are displaced in relation to one another so that an opening is formed through which air can pass. The two wings X1 and X2 of the rotor are turned 180 degrees in relation to one another, from below upward and in the direction of rotation. As a result a greater part of the wind force is concentrated on the lower part of the rotor than on its upper part, which contributes to the strength of the design, and even in the loaded state the speed of the rotor corresponds to about 1.2 times the velocity of the wind.

The windscrew rotor is maintained in its vertical position by a spring installed in the tranverse shaft A of the frame C. The frame C is pivotably connected to a base D. As the force of the wind increases to values entailing dangerous loading of the wings X1 and X2 and the rotor shaft B, the rotor turns steplessly to the horizontal position in the direction of the wind (Figs. 3 and 4). Since it also rotates in this position, it can take advantage of even very large wind forces. The design offers the advantage of low production costs considering its efficiency under the conditions for which it is intended.

Claims

1. A wind rotor device comprising

— a base (D),
— a frame (C) pivotably connected to the base (D),
— a rotor (X1, X2) comprising a pair of elongated wings (X1, X2) having an outer and an inner edge and a semicircular, cross-section and arranged in axial direction about a geometrical axis in a symmetrical fashion such that the concave sides of the wings (X1, X2) partially overlap each other, defining an axial passage between the inner edges of the wings (X1, X2),
— a shaft (B) extending in the direction of the geometrical axis and connecting one end of the rotor (X1, X2) to the frame (C), characterized in that
— the wings (X1, X2) are twisted in a screw-shaped manner in relation to one another,
— the shaft (B) is connected to the frame (C) in a pivotable manner, and
— means are provided for resiliently keeping the rotor (X1, X2) in a first axial direction in relation to the frame (C) but allowing the rotor (X1, X2) to pivot as a function of the wind strength acting on the r tor (X1, X2).

2. A device as claimed in Claim 1, characterized in that the wings (X1, X2) are twisted in relation to one another by substantially 180 degrees.

3. A device as claimed in Claim 1, characterized in that the shaft (B) is pivotable through an angle of substantially 90 degrees from its first axial direction.

4. A device as claimed in Claim 1, characterized in that the length of the rotor (X1, X2) is at least 4 times its diameter.

5. A device as claimed in Claim 1, characterized in that the means resiliently keeping the rotor (X1, X2) in the first axial direction is a spring.

Patentansprüche

1. Windschraube mit einem Grundteil (D), mit einem Ständer (C), der mit dem Grundteil (D) schwenkbar verbunden ist, mit einem Rotor (X1, X2), der ein Paar längerlicher Flügel (X1, X2) aufweist, die eine Außenkante und eine Innenkante sowie einen halbkreisförmigen Querschnitt aufweisen und die in axialer Richtung um eine geometrische Achse in einer symmetrischen Weise derart angeordnet sind, daß die konkaven Flügelseiten teilweise jeweils einander überlappen und einen axialen Durchgang zwischen den inneren Flügelkanten festlegen, und mit einer Welle (B), die in der Richtung der geometrischen Achse verläuft und die Ende des Rotors (X1, X2) mit dem Ständer (C) verbindet, dadurch gekennzeichnet, daß die Flügel (X1, X2) in einer schraubenförmigen Weise relativ zueinander gewunden sind, daß die Welle (B) mit dem Ständer (C) in einer schwenkbaren Weise verbunden ist und daß Einrichtungen vorgesehen sind, welche den Rotor (X1, X2) in einer ersten axialen Richtung in bezug auf den Ständer (C) federnd festhalten, jedoch eine Schwenkung des betreffenden Rotors (X1, X2) in Abhängigkeit von der auf den Rotor (X1, X2) wirkenden Windstärke ermöglichen.

2. Windschraube nach Anspruch 1, dadurch gekennzeichnet, daß die Flügel (X1, X2) in bezug zueinander um im wesentlichen 180° gewunden sind.

3. Windschraube nach Anspruch 1, dadurch gekennzeichnet, daß die Welle (B) um einen Winkel von im wesentlichen 90° aus ihrer ersten axialen Richtung schwenkbar ist.

4. Windschraube nach Anspruch 1, dadurch gekennzeichnet, daß die Länge des Rotors (X1, X2) zumindest viermal der Rotordurchmesser ist.

5. Windschraube nach Anspruch 1, dadurch gekennzeichnet, daß die den Rotor (X1, X2) in der ersten axialen Richtung federnd festhaltenden Einrichtungen durch eine Feder gebildet sind.

Revendications

1. Hélice éolienne à rotor comprenant une base (D); un bâti (C) monté pivotant sur la base (D); un rotor (X1, X2) comprenant une paire de pales allongées (X1, X2) présentant des bords extérieur et intérieur et une section transversale semi-circulaire, disposées dans le sens axial autour d'un axe géométrique d'une façon symétrique telle que les côtés concaves des pales (X1, X2) se chevauchent mutuellement partiellement, définissant un passage axial entre les bords intérieures des pales (X1, X2); un arbre (B) s'étendant dans le sens de l'axe géométrique et reliant l'une des extrémités du rotor (X1, X2) au bâti (C), ladite hélice étant caractérisée en ce que les pales sont torsadées en forme de vis l'une par rapport à l'autre; en ce que l'arbre (B) est relié au bâti (C) de façon pivotante; et en ce que des moyens sont prévus pour maintenir élastiquement le rotor (X1, X2) dans une première direction axiale par rapport au bâti (C) tout en permettant au rotor (X1, X2) de pivoter en fonction de la force du vent qui agit sur le rotor (X1, X2).

2. Hélice suivant la revendication 1, caractérisée en ce que les pales (X1, X2) sont torsadées d'environ 180° l'une par rapport à l'autre.

3. Hélice suivant la revendication 1, caractérisée en ce que l'arbre (B) peut pivoter d'un angle d'environ 90° à partir de sa première direction axiale.

4. Hélice suivant la revendication 1, caractérisée en ce que la longueur du rotor (X1, X2) est au moins le quadruple de son diamètre.

5. Hélice suivant la revendication 1, caractérisée en ce que moyens pour maintenir élastiquement le rotor (X1, X2) dans sa première direction axiale sont constitués par un ressort.

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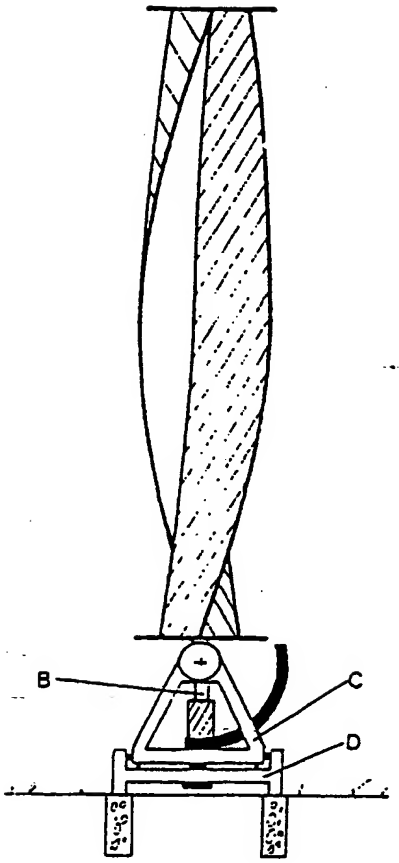

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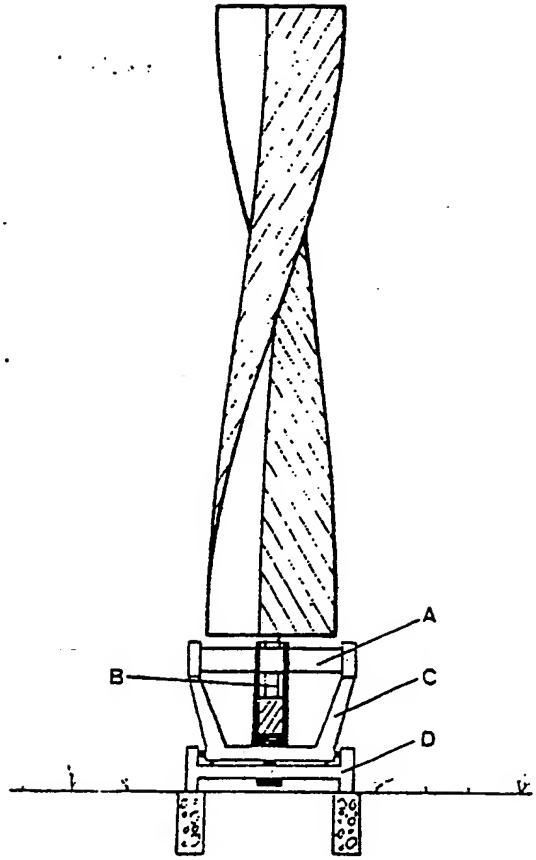

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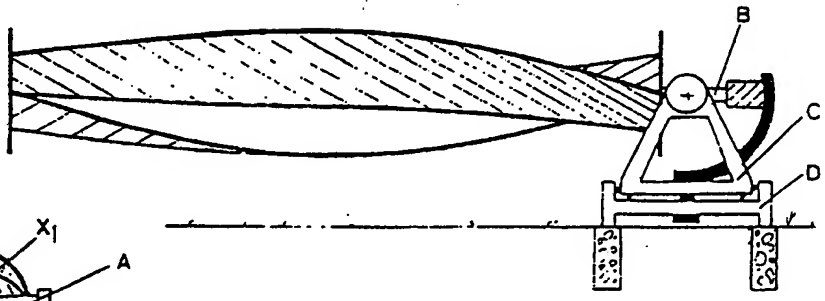

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